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(54) Title of the invention: Satellite broadcast reception system

(57) Abstract:

Problem to be solved: To simplify the constitution and to lower the price by allowing an exterior device to include a phase-locked loop for setting a local oscillation frequency, convert a signal received by an antenna into a low-frequency digital signal, and send it into a house through a multicore cable.

Solution: An outdoor device 200 amplifies the satellite broadcast radio wave received by the antenna 100 and converts and amplifies it to an intermediate frequency by a frequency converting circuit 210, and a demodulating circuit 212 demodulates the signal into a low-frequency digital signal and outputs it through an inexpensive coaxial cable 401. An indoor device 300 decodes the low-frequency digital signal into an analog video and sound signal by a decoder 307 to display the signal on a display unit 11 and reproduces its sound. A CPU 309 sends an

error signal corresponding to the user's operation of a channel selection key 310 to PLL 214 which controls the local frequency oscillator 213 of the indoor device 300 through the multicore cable 402 to select a channel. Consequently, only one frequency converting circuit is needed to simplify the circuit constitution. Here, cables are reducible to one inexpensive composite multicore cable.

#### [Claims]

[Claim 1] It is a satellite broadcasting service receiving system equipped with the antenna that receives the electric wave from a broadcasting satellite, the outdoor device installed in a RF side, and the indoor device installed in a low frequency side. The mentioned above outdoor device, the frequency converting circuit that changes into an intermediate frequency signal the mentioned above electric wave received with the mentioned above antenna. It has the demodulating circuit that restores to the output of this frequency converting circuit to the digital signal of low frequency. The mentioned above indoor device, the decoder that decodes the digital signal from the mentioned above demodulating circuit to the analog video signal and sound signal, the 1st coaxial cable that has CPU which the local oscillation frequency of the mentioned above frequency converting circuit is changed, and tunes it in, and transmits the mentioned above digital signal to the mentioned above indoor device from the mentioned above outdoor device further.

The satellite broadcasting service receiving system characterized by having the 2nd coaxial cable that

connects between the mentioned above CPUs and the mentioned above frequency converting circuits.

[Claim 2] The mentioned above frequency converting circuit is the satellite broadcasting service receiving system according to the claim 1 that is equipped with the frequency mixer which considers the mentioned above electric wave as one input, the variable frequency oscillator that generates the RF signal of the local oscillation frequency used as the input of another side of this mixer and the phase-locked loop that sets up the oscillation frequency of this oscillator, and is characterized by the mentioned above CPU being what inputs the error signal according to channel selection information into the mentioned above phase-locked loop.

[Claim 3] It is a satellite broadcasting service receiving system equipped with the antenna that receives the electric wave from a broadcasting satellite, the outdoor device installed in a RF side and the indoor device installed in a low frequency side. The mentioned above outdoor device, the frequency converting circuit that changes into an intermediate frequency signal the mentioned above electric wave received with the mentioned above antenna. The demodulating circuit that restores to the output of this frequency converting circuit to the digital signal of low frequency, it has the 1st CPU that the local oscillation frequency of the mentioned above frequency converting circuit is changed, and tunes it in. The mentioned above indoor device, the decoder that decodes the digital signal from the mentioned above demodulating circuit to the analog video signal and sound signal, it has the 2nd CPU that communicates with the

mentioned above 1st CPU and transmits channel selection information. Also, the satellite broadcasting service receiving system characterized by having the coaxial cable that transmits the mentioned above digital signal to the mentioned above indoor device from the mentioned above outdoor device and is used for communication between the mentioned above 1st CPU and the mentioned above 2nd CPU.

[Claim 4] The frequency mixer with which the mentioned above frequency converting circuit considers the mentioned above electric wave as one input, the variable frequency oscillator that generates the RF signal of the local oscillation frequency used as the input of another side of this mixer, have the phase-locked loop that sets up the oscillation frequency of this oscillator and the mentioned above 1st CPU inputs an error signal into the mentioned above phase-locked loop. The mentioned above 2nd CPU is the satellite broadcasting service receiving system according to the claim 3 characterized by being what supplies the channel selection information that becomes the radical of the mentioned above error signal to the mentioned above 1st CPU.

[Detailed description of the invention]

[0001]

[Field of the invention] This invention relates to the satellite broadcasting service receiving system that receives the electric wave from satellite broadcasting service, and reproduces a video signal and a sound signal.

[0002]

[Description of the prior art] It becomes reception of satellite broadcasting service, and reproducible by adding a satellite broadcasting service receiving system equipped with BS antenna that receives the electric wave from a broadcasting satellite to the usual television receiver that receives the electric wave (terrestrial wave) from a terrestrial broadcasting station, and reproduces a video signal and a sound signal, the outdoor device installed in a RF side, and the indoor device installed in a low frequency side.

[0003] Drawing 3 is the system configuration drawing showing an example of the conventional satellite broadcasting service receiving system. In this drawing, the antenna for satellite broadcasting service reception (BS) 100 is installed in the outdoors, the outdoor device (ODU) 200 is installed in the latter part of an antenna 100, and 300 are indoor devices (IDU) of an outdoor device 200 further installed in the latter part.

[0004] The high-frequency amplifier 201 that amplifies the RF which the outdoor device 200 was called the low noise block converter (LNB), and was received with the antenna 100, for example, the satellite broadcasting electric-wave of a 12GHz band, (RFAMP), the band-pass filter 202 that removes a noise component from the output of this amplifier 201 (BPF), the output of this filter 202, for example, the 1st frequency mixer 203 changed into the 1st intermediate frequency signal of a frequency band of 1GHz (MIX), this mixer 203 is equipped with the fixed frequency oscillator (OSC) 204 that supplies a predetermined local oscillation signal, and the

intermediate frequency amplifier (IFAMP) 205 of the output stage that amplifies the output of a mixer 203.

[0005] An indoor device 300, the intermediate frequency amplifier 301 of an input stage (IFAMP), the 2nd frequency mixer 302 that carries out frequency conversion of the output of this amplifier to the 2nd intermediate frequency signal of a still lower frequency, for example, a 400MHz band, (MIX), the variable frequency oscillator 303 that supplies a local oscillation signal to this 2nd mixer 302 (OSC), the intermediate frequency amplifier 304 that amplifies the output of a mixer 302 (IFAMP), the band-pass filter 305 that removes a noise component from the output of this amplifier 304 (BPF), it has the demodulating circuit (DEMOD) 306 that restores to the output of this filter 305, and the decoder (DEC) 307 which decodes the digital output of this demodulating circuit 306 and reproduces the analog video signal and sound signal and the output of this decoder circuit is reproduced on a display 311.

[0006] An indoor device 300 equips further the phase-locked loop (PLL) 308 that determines the oscillation frequency of a variable frequency oscillator 303, CPU 309 that gives an error signal to this phase-locked loop 308, and this CPU 309 with the channel selection key 310 that gives the channel selection information which becomes the radical of the mentioned above error signal, and the block except a display 311 is set as a broadcasting satellite tuner.

[0007]

[Problems to be solved by the invention] There are the following problems in the system of drawing 3. (1) The signal transmitted to an indoor device 300 from an outdoor device 200 becomes cost quantity in order that it is necessary to use a coaxial cable with little loss for the indoor transmission medium 400 for drawing in since it is a high frequency band (1GHz band), and the die length may generally be amount to about 20m. (2) Since the frequency converting circuit containing a frequency mixer and a local frequency oscillator is required for both an outdoor device 200 and the indoor device 300, circuitry is complicated, and there are many components mark and they become expensive.

[0008] It aims at simplifying and offering a cheap satellite broadcasting service receiving system with the configuration which this invention can omit the frequency converting circuit by the side of an indoor device, and can use a cheap coaxial cable for the signal transmission by the side of an indoor device.

[0009]

[Means for solving the problem] The antenna with which the above mentioned purpose of this invention receives the electric wave from a broadcasting satellite, and the outdoor device installed in a RF side, it is a satellite broadcasting service receiving system equipped with the indoor device installed in a low frequency side, the mentioned above outdoor device, the frequency converting circuit that changes into an intermediate frequency signal the mentioned above electric wave received with the mentioned above antenna, it has the

demodulating circuit that restores to the output of this frequency converting circuit to the digital signal of low frequency. The mentioned above indoor device, the decoder that decodes the digital signal from the mentioned above demodulating circuit to the analog video signal and sound signal, the 1st coaxial cable that has CPU which the local oscillation frequency of the mentioned above frequency converting circuit is changed, and tunes it in, and transmits the mentioned above digital signal to the mentioned above indoor device from the mentioned above outdoor device further, a satellite broadcasting service receiving system equipped with the 2nd coaxial cable that connects between the mentioned above CPUs and the mentioned above frequency converting circuits can attain.

[0010] According to 1 operation embodiment of this invention, the mentioned above frequency converting circuit is equipped with the frequency mixer that considers the mentioned above electric wave as one input, the variable frequency oscillator that generates the RF signal of the local oscillation frequency used as the input of another side of this mixer and the phase-locked loop that sets up the oscillation frequency of this oscillator and the mentioned above CPU inputs the error signal according to channel selection information into the mentioned above phase-locked loop.

[0011] The antenna with which the above mentioned purpose of this invention receives the electric wave from a broadcasting satellite again, it is a satellite broadcasting service receiving system equipped with the outdoor device installed in a RF side and the indoor device installed in a low frequency side.



The mentioned above outdoor device, the frequency converting circuit that changes into an intermediate frequency signal the mentioned above electric wave received with the mentioned above antenna, the demodulating circuit which restores to the output of this frequency converting circuit to the digital signal of low frequency, it has the 1st CPU that the local oscillation frequency of the mentioned above frequency converting circuit is changed, and tunes it in. The mentioned above indoor device, the decoder that decodes the digital signal from the mentioned above demodulating circuit to the analog video signal and sound signal, it has the 2nd CPU that communicates with the mentioned above 1st CPU and transmits channel selection information.

Also, a satellite broadcasting service receiving system equipped with the coaxial cable that transmits the mentioned above digital signal to the mentioned above indoor device from the mentioned above outdoor device and is used for communication between the mentioned above 1st CPU and the mentioned above 2nd CPU can attain.

[0012] According to 1 operation embodiment of this invention, the mentioned above frequency converting circuit, the frequency mixer that considers the mentioned above electric wave as one input, and the variable frequency oscillator that generates the RF signal of the local oscillation frequency used as the input of another side of this mixer, it has the phase-locked loop that sets up the oscillation frequency of this oscillator, the mentioned above 1st CPU inputs an error signal into the mentioned above phase-locked loop, and the mentioned above 2nd

CPU supplies the channel selection information set to the mentioned above 1st CPU on the radical of the mentioned above error signal.

[0013] The outdoor device of this invention changes into an intermediate frequency signal the satellite broadcasting electric-wave of the high frequency received with the satellite broadcasting service receiving dish and restores to it even to the digital signal of low frequency further. For this reason, an indoor device does not need a frequency converting circuit that what is necessary is just to have low frequency processing circuits, such as a circuit that decodes the mentioned above digital signal to the video signal and sound signal of an analog. Thus, a system-wide configuration is simplified.

[0014] The outdoor device of this invention outputs the digital signal of low frequency. Thus, a cheap coaxial cable is enough as the cable that transmits this digital signal to an indoor device, and it can reduce system cost.

[0015]

[Embodiment of the invention] Next, this invention is explained in details with reference to the operation embodiment shown on the drawing. Drawing 1 is the block diagram of the satellite broadcasting service receiving system in which 1 operation embodiment of this invention is shown. In this drawing, BS antenna 100 receives the electric wave from a broadcasting satellite, the outdoor device (ODU) 200 is installed in a RF side, the indoor device (IDU) 300 is installed in a low frequency side, and 401 and 402 are the 1st and 2nd coaxial cables that connect between an outdoor device 200 and indoor devices 300.

[0016] An outdoor device 200 has the high-frequency amplifier 201 that amplifies the mentioned above electric wave received with the antenna 100, the band-pass filter 202 that removes a noise component from the output of this amplifier 201, the frequency converting circuit 210 that changes the output of this filter 202 into an intermediate frequency signal, the intermediate frequency amplifier 205 that amplifies the output of this frequency converting circuit 210, the band-pass filter 211 that removes a noise component from the output of this amplifier 205, and the demodulating circuit 212 that restores to the output of this filter 211 to the digital signal of low frequency.

[0017] A frequency converting circuit 210 is equipped with the frequency mixer 203 that considers the mentioned above electric wave as one input, the variable frequency oscillator 213 that generates the RF signal of the local oscillation frequency used as the input of another side of this mixer 203 and the phase-locked loop 214 that sets up the oscillation frequency of this oscillator 213. To this phase-locked loop 214, the error signal according to channel selection information is inputted from CPU by the side of an indoor device 300.

[0018] An indoor device 300 has the decoder 307 that decodes the digital signal from the demodulating circuit 212 of an outdoor device 200 to the analog video signal and sound signal, CPU 309 that the local oscillation frequency of the frequency converting circuit 210 of an outdoor device 200 is changed and tunes it in, the channel selection key 310 that gives channel selection information to this CPU 309 and the display 311 that reproduces the

video signal and sound signal that were decoded by the decoder 307. Among these, the block except a display 311 is set as a broadcasting satellite tuner.

[0019] The digital signal outputted from the demodulating circuit 212 of an outdoor device 200 is transmitted to an indoor device 300 from an outdoor device 200 by the 1st multicore transmission medium 401. Also, it connects with the 2nd coaxial cable 402 between CPU 309 of an indoor device 300 and the frequency converting circuit 210 of an outdoor device 200. Since the frequency of the signal which these coaxial cables 401 and 402 transmit is a frequency far lower than the 1st intermediate frequency (1GHz) of drawing 3, an expensive coaxial cable does not need to be used for it.

[0020] Also, since it is equal to what omitted the circuit where the system configuration of drawing 1 is equivalent to mixers 203 or 302, the local oscillator 204, an output amplifier 205, and the input amplifier 301 among the system configurations of drawing 3 in drawing 1 as compared with drawing 3, a system configuration is easy and becomes cheap.

[0021] Drawing 2 is the satellite broadcasting service receiving structure of system drawing showing the 2nd operation embodiment of this invention. In this drawing, the antenna 100 receives the electric wave from a broadcasting satellite, the outdoor device 200 is installed in a RF side, the indoor device 300 is installed in a low frequency side, and 403 are the only coaxial cables that connect between an outdoor device 200 and indoor devices 300.

[0022] The high-frequency amplifier 201 that amplifies the above mentioned signal that was received by the outdoor device 200 with the antenna 100, the band-pass filter 202 that removes a noise component from the output of this amplifier 201, the frequency converting circuit 210 that changes the output of this filter 202 into an intermediate frequency signal, the intermediate frequency amplifier 205 that amplifies the output of this frequency converting circuit 210, it has the band-pass filter 211 that removes a noise component from the output of this amplifier 205, the demodulating circuit 212 that restores to the output of this filter 211 to the digital signal of low frequency and 1st CPU 215 that the local oscillation frequency of a frequency converting circuit 210 is changed, and tunes it in.

[0023] A frequency converting circuit 210 is equipped with the frequency mixer 203 that considers the mentioned above electric wave as one input, the variable frequency oscillator 213 that generates the RF signal of the local oscillation frequency used as the input of another side of this mixer 203 and the phase-locked loop 214 that sets up the oscillation frequency of this oscillator 213. To this phase-locked loop 214, the error signal according to channel selection information is inputted from 1st CPU 215.

[0024] An indoor device 300 has the decoder 307 that decodes the digital signal from the demodulating circuit 212 of an outdoor device 200 to the analog video signal and sound signal, 2nd CPU 309 that transmits channel selection information to 1st CPU 215 of an outdoor device 200, and the display 311 that reproduces the video signal

and sound signal which were decoded by the input channel selection key 310 and the decoder 307 in channel selection information to this CPU 309. Among these, the block except a display 311 is set as a broadcasting satellite tuner.

[0025] The frequency mixer 203 with which the frequency converting circuit 210 of this example considers the mentioned above electric wave as one input, the variable frequency oscillator 213 that generates the RF signal of the local oscillation frequency used as the input of another side of this mixer, having the phase-locked loop 214 that sets up the oscillation frequency of this oscillator, 1st CPU 215 inputs an error signal into a phase-locked loop 214, and 2nd CPU 309 supplies the channel selection information set to 1st CPU 215 on the radical of the mentioned above error signal.

[0026] Between the outdoor device 200 and the indoor device 300, it connects with the only coaxial cable 403 and is used for communication between 1st CPU 215 and 2nd CPU 309. CPU 215 and CPU 309 play not only transfer of channel selection information but the role which transmits the recovery digital signal of a demodulating circuit 212 to a decoder 307.

[0027]

[Effect of the invention] The configuration that according to this invention can omit the frequency converting circuit by the side of an indoor device, and can use a cheap coaxial cable for the signal transmission by the side of an indoor device as stated above, it can simplify and a cheap satellite broadcasting service receiving system can be offered.

[Brief description of the drawings]

[Drawing 1] is the system configuration drawing showing the 1st operation embodiment of this invention.

[Drawing 2] is the system configuration drawing showing the 2nd operation embodiment of this invention.

[Drawing 3] is the system configuration drawing showing the conventional example of a satellite broadcasting service receiving system.

[Description]

100 Antenna

200 Outdoor Device

210 Frequency Converting Circuit

212 Demodulating circuit

215 1st CPU

300 Indoor Device

307 Decoder

309 2nd CPU

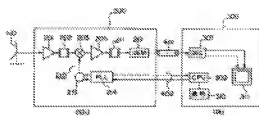
310 Channel Selection Key

401 1st Coaxial Cable

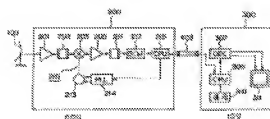
402 2nd Coaxial Cable

403 Coaxial Cable

Drawing 1



Drawing 2



Drawing 3

